INNOVA JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATIONS 2
in preparation for General Certificate of Education Advanced Level
Higher 1

CANDIDATE NAME			
CLASS		INDEX NUMBER	

CHEMISTRY 8872/01

Paper 1 Multiple Choice **17 September 2008**

50 min

Additional Materials: Data Booklet
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

Section A

For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider to be correct.

1 Acidified aqueous potassium dichromate(VI) oxidizes ethanedioate ions, $C_2O_4^{2-}$, to CO_2.

What volume of 0.020 mol dm^{-3} potassium dichromate(VI) is required to oxidize completely 1.0×10^{-3} mol of the salt $KHC_2O_4 \cdot H_2C_2O_4$?

A 17 cm^3 **C** 50 cm^3

B 33 cm^3 **D** 125 cm^3

2 Nervous disorders due to mercury poisoning occur when mercury forms a 1:1 complex with lipoyl groups, which are vital for glucose metabolism.

For a human containing 3.0 kg of body fluid, what is the mass of mercury (A_r 200) required to complex all the lipoyl groups? [Average concentration of lipoyl groups in body fluid = 1.0×10^{-8} mol kg^{-1}]

A 1.5×10^{-9} g **C** 6.0×10^{-8} g

B 3.0×10^{-8} g **D** 6.0×10^{-6} g

3 When methane, CH_4, was burned in an incorrectly adjusted burner, it was converted into a mixture of carbon dioxide and carbon monoxide in the ratio 99:1, together with water vapour.

What is the volume of oxygen consumed when 4 dm^3 of methane is burned?

A 7.98 dm^3 **C** 3.98 dm^3

B 7.96 dm^3 **D** 3.96 dm^3

4 Which of the following atoms or ions has 1 unpaired electron?

A N^-

B O

C S^{2-}

D Sc

5 Which one of the following equations relates to the first ionization energy of bromine?

A $Br\ (l) \longrightarrow Br^+(g) + e^-$

B $Br\ (g) \longrightarrow Br^+(g) + e^-$

C $\frac{1}{2}Br_2\ (l) \longrightarrow Br_2^-(g) - e^-$

D $\frac{1}{2}Br_2\ (g) \longrightarrow Br_2^-(g) + e^-$

6 In which of the following will an ionic compound be formed between the named atoms?

A Hydrogen and sodium

B Hydrogen and chlorine

C Boron and fluorine

D Silicon and chlorine

7 Why is ethanol more soluble than ethyl ethanoate in water?

A A hydrogen bond forms between the hydrogen of the –OH group in ethanol and the hydrogen of a water molecule.

B A hydrogen bond forms between the hydrogen of the –OH group in the ethanol and the oxygen of a water molecule.

C Ethanol is a polar molecule, but ethyl ethanoate is non-polar.

D Ethanol is able to dissociate into hydrogen ions and ethoxide ions, but ethyl ethanoate is not able to dissociate.

8 Which of the following molecules **do not** have all the atoms lying on the same plane?

A PH_3

B H_2O

C ICl_3

D $BrCl_4^-$

9 Potassium-argon dating is used to determine the age of igneous rocks. Potassium in these rocks gradually breaks down into argon and the gas is trapped in the rock. This radioactive decay is first order reaction with a rate constant of 5.33×10^{-10} per year.

A sample of igneous rock, containing some potassium, is examined.
If the amount of argon gas measured is 7 times as much as potassium, what is the age of the rock?

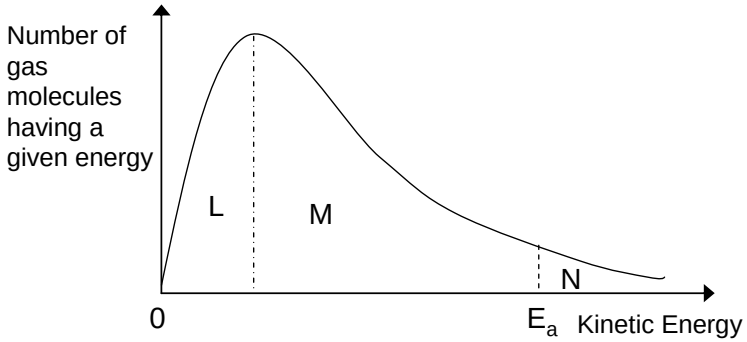
A 1.3×10^9 years

B 2.6×10^9 years

C 3.9×10^9 years

D 9.1×10^9 years

10 The Boltzmann distribution shows the number of molecules having a particular kinetic energy at constant temperature.



If the temperature is decreased by 10 ºC, what happens to the size of the areas labelled L, M and N?

	L	M	N
A	decreases	decreases	decreases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	decreases	increases

11 Which of the following has an effect on the magnitude of the equilibrium constant?

A Removing the products as they were formed.

B Change the temperature.

C Increase the pressure in a gas-phase reaction.

D Add a catalyst.

12 At 450 ^{o}C, the equilibrium constant, K_p, is 3.00×10^{-4} for the equilibrium:

$$N_2O_4\,(g) \rightleftharpoons N_2\,(g) + 2O_2\,(g)$$

What is the K_p for the following equilibrium at the same temperature?

$$N_2\,(g) + 2O_2\,(g) \rightleftharpoons N_2O_4\,(g)$$

A 3.00×10^{4}

B 3.33×10^{3}

C 3.00×10^{-4}

D 3.33×10^{-3}

13 For which compound is the lattice energy likely to have the greatest magnitude?

A Lithium fluoride

B Lithium iodide

C Rubidium chloride

D Sodium chloride

14 The standard enthalpy changes of formation of carbon dioxide and water are –394 kJ mol^{-1} and –286 kJ mol^{-1} respectively. If the standard enthalpy change of combustion of propyne, C_3H_4, is –1938 kJ mol^{-1}, what is its standard enthalpy change of formation?

A + 1258 kJ mol^{-1}

B – 1258 kJ mol^{-1}

C + 184 kJ mol^{-1}

D – 184 kJ mol^{-1}

15 Liquid ammonia dissociates as follows: $2NH_3\ (l) \rightleftharpoons NH_4^+\ (aq) + NH_2^-\ (aq)$

At a certain temperature, the ionic product of liquid ammonia is given as:

$K_{amm} = [NH_4^+][NH_2^-] = 1.0 \times 10^{-22}\ mol^2\ dm^{-6}$

What is the total concentration of ions in this equilibrium mixture?

A 1.0 x 10^{-11} mol dm^{-3}

B 1.0 x 10^{-22} mol dm^{-3}

C 2.0 x 10^{-11} mol dm^{-3}

D 2.0 x 10^{-22} mol dm^{-3}

16 Which pairs of reactions *could* have the same common intermediate?

W $CH_3CO_2CH(CH_3)_2 \longrightarrow$ intermediate $\longrightarrow CH_3CHBrCH_3$

X $CH_3CH{=}CH_2 \longrightarrow$ intermediate $\longrightarrow CH_3CH(CN)CH_3$

Y $CH_3CH_2COOH \longrightarrow$ intermediate $\longrightarrow CH_3CH_2CH_2Cl$

Z $CH_3CHClCH_3 \longrightarrow$ intermediate $\longrightarrow CH_3COCH_3$

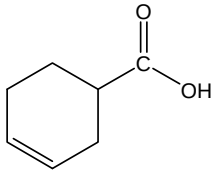
A **W** and **X**

B **W** and **Y**

C **W** and **Z**

D **Z** and **Y**

17 Compound **G** has the structure as shown below.



How many sigma (σ) and pi (π) bonds does the compound **G** have?

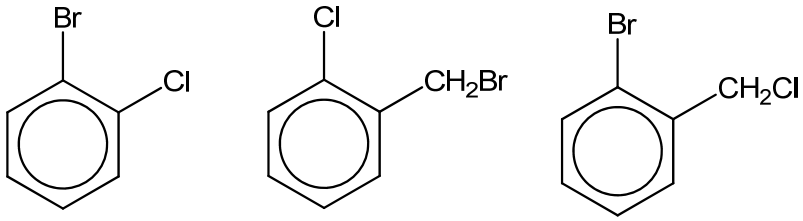
A 19 σ and 2 π

B 10 σ and 2 π

C 19 σ and π

D 10 σ and π

18 Experiments are carried out on three compounds.



P **Q** **R**

To 0.010 mol samples of each of **P**, **Q** and **R** is added 10cm^3 of water and the samples are shaken and held at a fixed temperature for 2 days.

An excess of aqueous silver nitrate is then added to each sample and the precipitate produced is filtered off, washed, dried and weighed. The three samples of precipitate weigh 0.000g, 0.014 g and 0.018 g

Which sequence of compounds matches these results?

	0.000g	0.014 g	0.018 g
A	P	R	Q
B	P	Q	R
C	Q	R	P
D	R	Q	P

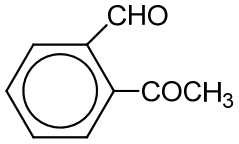
19 The table shows the result of simple tests on a compound **T**.

reagent	*result*
2,4-dinitrophenylhydrazine	positive
alkaline aqueous iodine	positive
Fehling's reagent	negative

From the result of the tests, what could compound **T** be?

A $CH_3CH(OH)COOH$

B



C CH_3COCH_2CHO

D $CH_3COOCH_2CH_3$

20 Which reaction yields an organic compound incorporating deuterium? [D = ^2H]

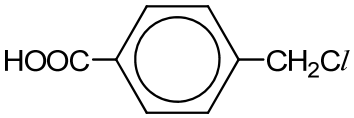
A $CH_3CH_2CN \xrightarrow[D_2O]{NaOD}$

B $CH_3CD(OD)COOH \xrightarrow[heat]{\text{acidified } KMnO_4}$

C $CH_3COCBr_3 \xrightarrow[D_2O]{NaOD}$

D $(CH_3)_3COH \xrightarrow[heat]{\text{conc. } D_2SO_4}$

21 What type of reaction does the compound below ***not*** undergo?



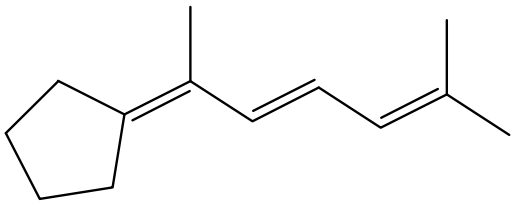
A Free radical substitution

B Nucleophilic substitution

C Acid-base

D Electrophilic addition

22 Compound **A** has the following structure.



How many geometric isomers do compound **A** have?

A 2 **C** 8

B 4 **D** 16

23 Which sequence shows the correct order of **decreasing** acidity?

A CH_3CH_2OH > CH_2FCOOH > CH_3COOH

B CH_3CH_2OH > CH_3COOH > CH_2FCOOH

C CH_3COOH > CH_2FCOOH > CH_3CH_2OH

D CH_2FCOOH > CH_3COOH > CH_3CH_2OH

24 Three types of oxides required to make coloured glass in church windows are one macromolecular, one ionic and one of a transition metal. Which of the following combinations of oxides is likely to produce a coloured glass?

A Al_2O_3, MgO, SnO

B SiO_2, CaO, PbO

C P_4O_{10}, CaO, CuO

D SiO_2, PbO, CoO

25 An element of Period 3 is heated with chlorine gas. The product is purified and then added to water. The resulting solution is found to be neutral. What is the element?

A Sodium

B Aluminum

C Silicon

D Phosphorus

Section B

For each of the questions in this section, one or more of the three numbered statements 1 to 3 may be correct.

Decide whether each of the statement is or is not correct (you may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A, B, C,** and **D** should be selected on the basis of

A	B	C	D
1, 2 and **3** are correct	**1** and **2** are correct	**2** and **3** are correct	**1** only is correct.

26 Which of the following pairs of compounds does the first member have a smaller boiling point than the second member

1 CO_2, CS_2

2 HBr, HF

3 2-nitrophenol, 4-nitrophenol

27 Bromine and methanoic acid react as follows:

$Br_2(aq) + HCOOH(aq) \longrightarrow 2Br^-(aq) + 2H^+(aq) + CO_2(g)$

The rate of reaction is found to be first order with respect to both bromine and to methanoic acid.

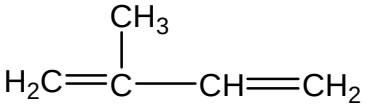
Which of the following deductions can be made from this information?

1 Doubling the concentration of methanoic acid doubles the rate of evolution of gas.

2 Halving the concentration of both reactants simultaneously will halve the reaction rate.

3 The overall order of reaction is one.

28 2-methylbuta-1,3-diene can be polymerised to make synthetic rubbers. The structure of this monomer is shown below.



Which of the following statements about 2-methylbuta-1,3-diene are correct?

1 It decolourises aqueous bromine.

2 It changes the colour of acidified $K_2Cr_2O_7$ from orange to green.

3 It undergoes nucleophilic addition reactions.

The responses **A, B, C,** and **D** should be selected on the basis of

A	B	C	D
1, 2 and **3** are correct	**1** and **2** are correct	**2** and **3** are correct	**1** only is correct.

29 Which compounds may be prepared from $C_6H_5CHBrCH_3$ by the action of sodium hydroxide under different conditions?

1 $C_6H_5CO_2Na$

2 $C_6H_5CH(OH)CH_3$

3 $C_6H_5CH{=}CH_2$

30 Which of the following are correct trends of the elements across Period 3?

1 Electronegativity increases.

2 First ionization energy increases.

3 Ionic radius decreases.

End of Paper